Feb. 24, 1953 G. H. FORSYTH 2,629,594

BOUNCING BALL GAME DEVICE

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Fig. 1

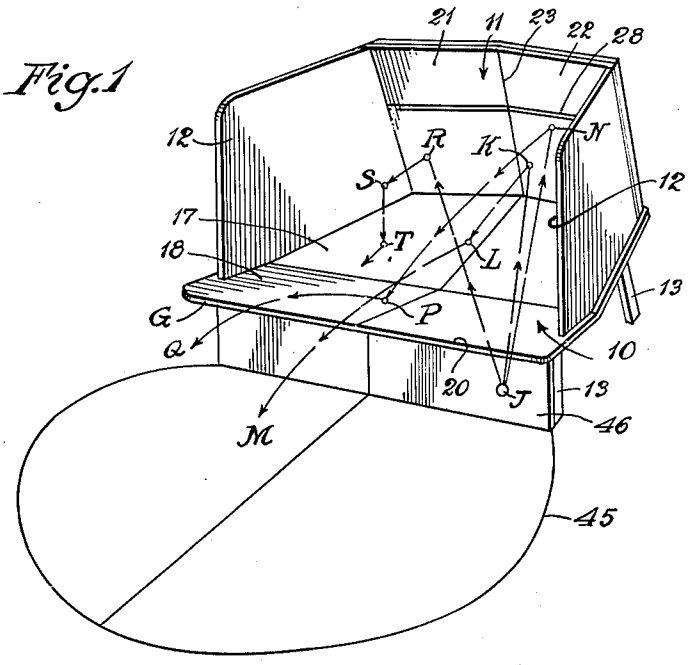
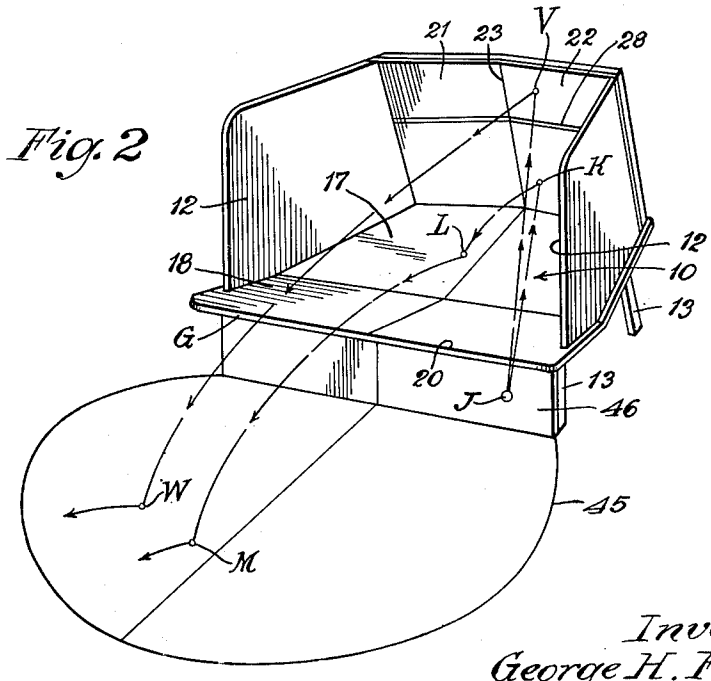


Fig. 2



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BOUNCING BALL GAME DEVICE

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Fig. 3

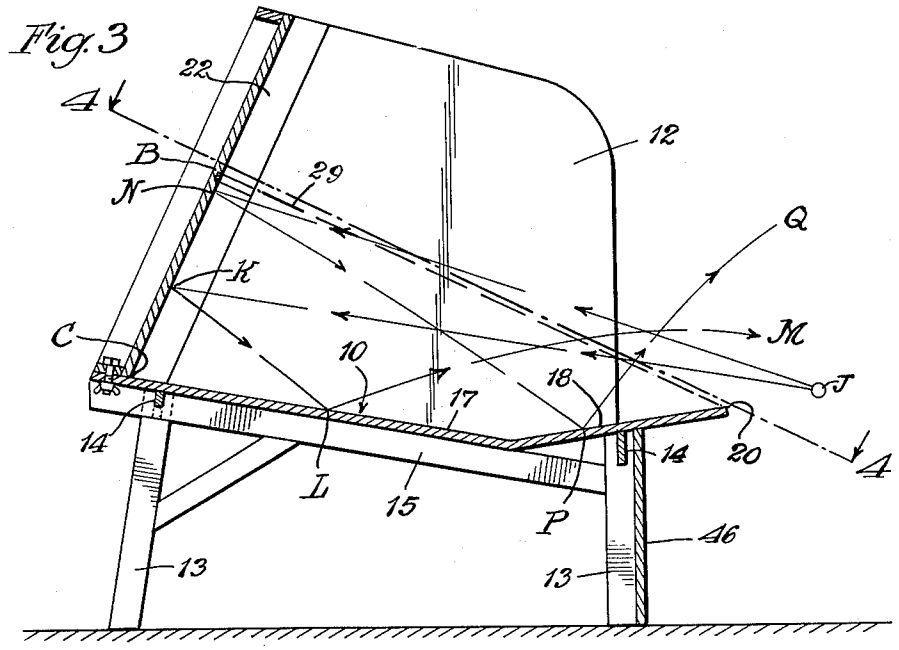
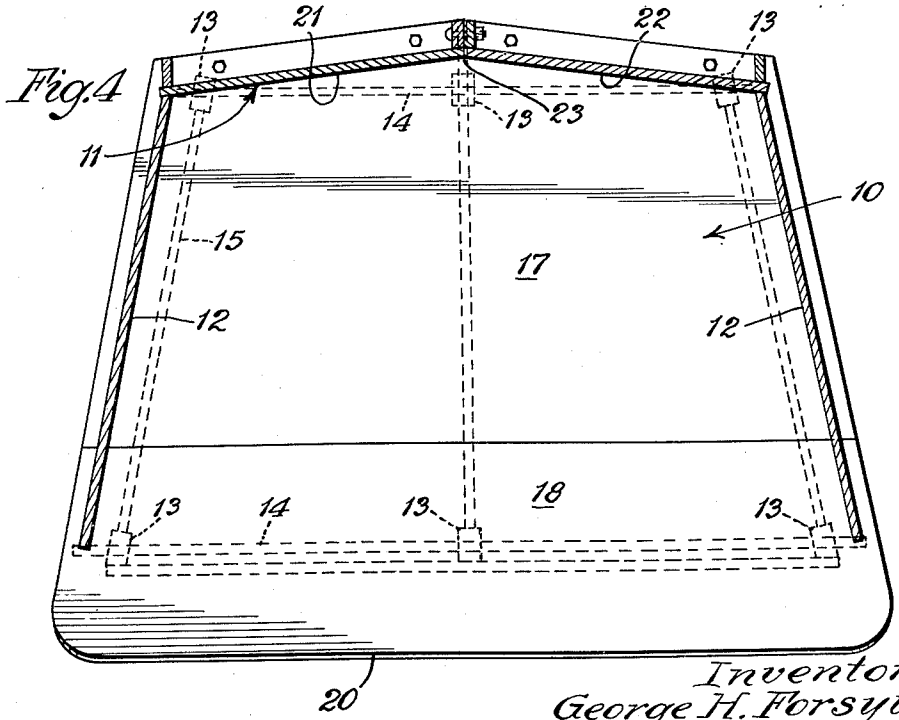


Fig. 4



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BOUNCING BALL GAME DEVICE

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Fig. 5

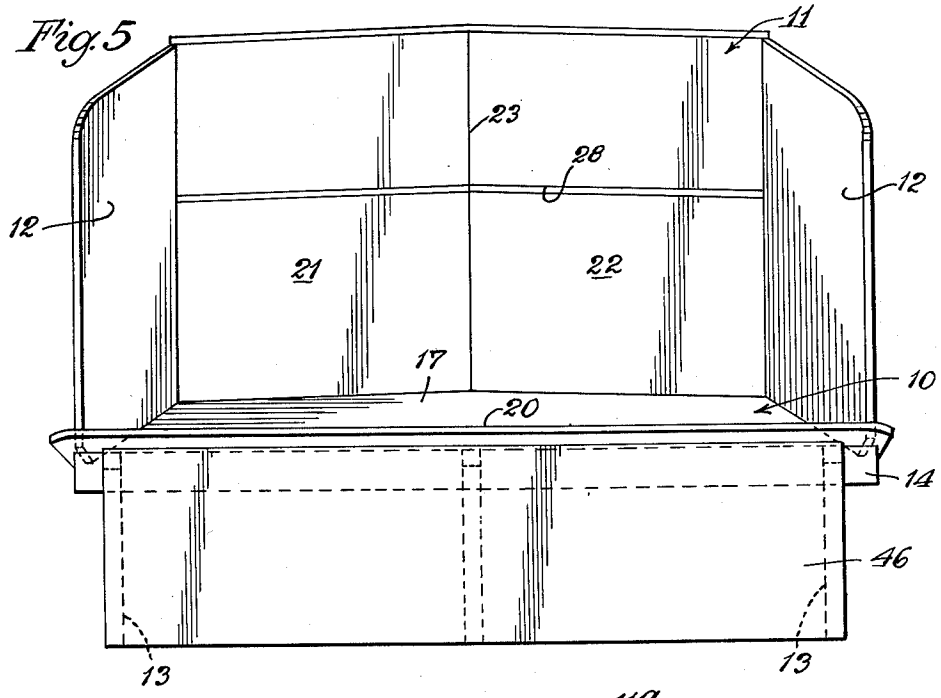
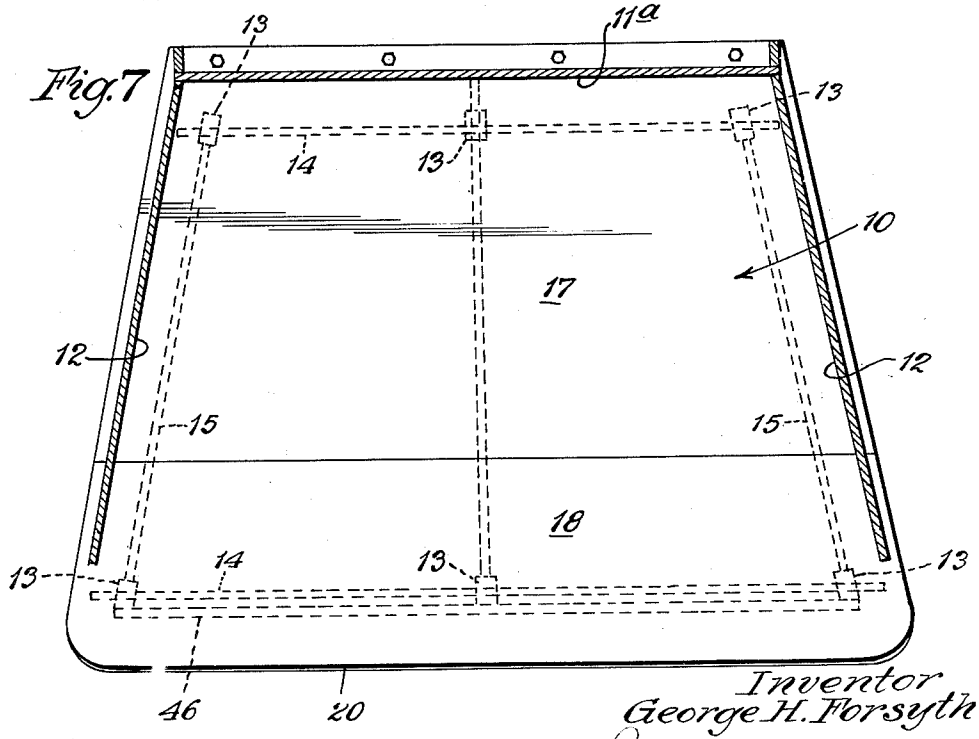


Fig. 7



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BOUNCING BALL GAME DEVICE

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Fig. 6

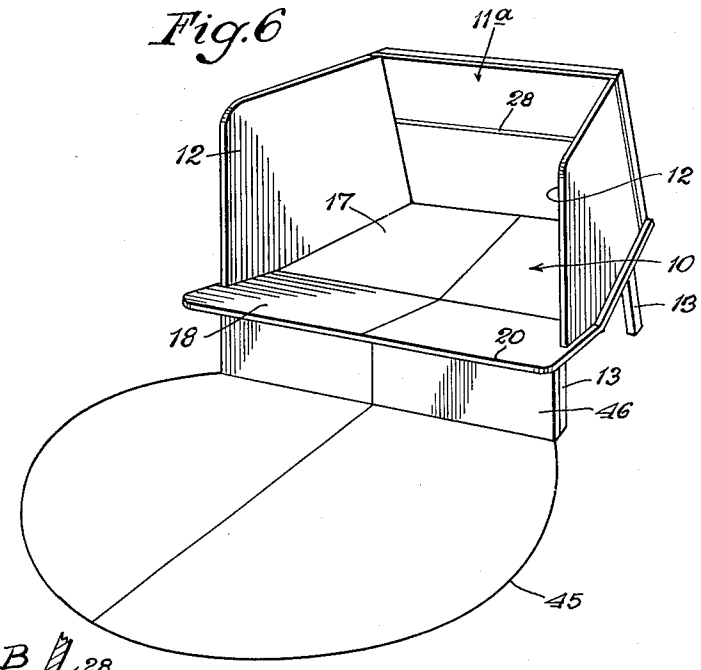


Fig. 8

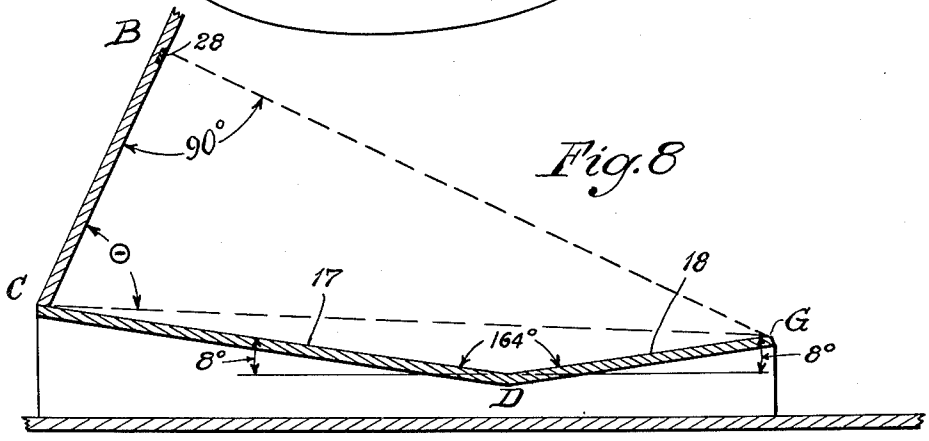


Fig. 9

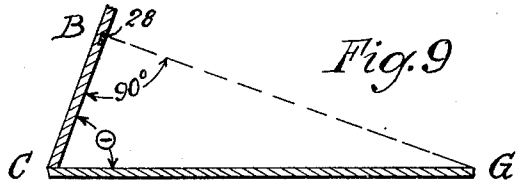
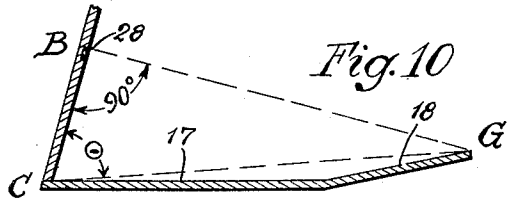


Fig. 10



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Patented Feb. 24, 1953 2,629,594

UNITED STATES PATENT OFFICE

2,629,594

BOUNCING BALL GAME DEVICE

George H. Forsyth, Evanston, Ill.

Application September 13, 1951, Serial No. 246,407

6 Claims. (Cl. 273—30)

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This invention relates to improvements in apparatus for a game of the type played with a paddle or bat and a ball, and more particularly for a game somewhat similar to table tennis intended to be played indoors.

One of the principal objects of the invention is to provide a table court game apparatus including a playing court with an upright abutment wall at one end arranged in a predetermined inclined relation to the playing court so as to keep the ball in play for extended relays by insuring a rebound on the surface of the playing court, all of the relationships of the rebounding surfaces being directed to this end.

A further object of the invention is to provide an apparatus of the kind above referred to wherein the various rebounding surfaces are integrated so as to produce a game readily adaptable for players of varying skills and for use in relatively small or large quarters or floor space, as desired.

A further object of the invention is to provide an apparatus including a playing court and an abutment wall wherein the court is normally supported at substantially the height of an ordinary table, but which is adapted for a type of game wherein the ball must be kept in play by returning it to the abutment before the ball strikes the floor, or for another type of game wherein the ball may also rebound on a second court at the floor level on which the game apparatus is supported.

The present application is a continuation-in-part of my prior application bearing Serial Number 443,847, filed May 27, 1942, now abandoned, and of my copending application bearing Serial Number 617,329, filed September 19, 1945. The game apparatus of the present application discloses preferred proportions and angular arrangement of the playing surfaces of the court and abutment which have been found by experience to be most desirable for a game apparatus of this kind.

The game apparatus of my invention is characterized by the disposition of the end abutment wall at a substantial angle of inclination toward the player end of the court, as broadly disclosed in my copending application, Serial Number 617,329, which insures that a ball struck from the player end of the court against said inclined abutment and impinging on the latter below a prescribed boundary line will tend to be deflected downwardly on rebound so as to bounce on the surface of the court before it reaches the player end of the court.

The apparatus is especially adapted for a contest between two players, both standing at the same end of the table court, and alternately striking the ball to keep it in play.

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Other objects and advantages of the invention will appear from time to time as the following description proceeds.

The invention may best be understood by reference to the accompanying drawings, in which:

Figure 1 is a perspective view of one form of the apparatus set up in position for play in connection with a floor court, and illustrating the manner of rebound of a ball when struck in certain directions toward the end abutment wall;

Figure 2 is a view similar to Figure 1, but illustrating the manner of rebound of the ball when struck in certain other directions toward the end abutment wall, so as to rebound finally on the floor court;

Figure 3 is an enlarged longitudinal section of the apparatus shown in Figure 1;

Figure 4 is a sectional view of the apparatus taken generally on line 4—4 of Figure 3;

Figure 5 is an end view of the apparatus shown in Figure 3, looking from the player end of the court toward the abutment wall;

Figure 6 is a perspective view of a modified form of apparatus similar to that shown in the preceding figures, excepting that the end abutment wall is substantially straight from one side to the other instead of being formed of two panels diverging horizontally from the vertical center line of the end wall toward the player end of the court;

Fig. 7 is a sectional view of the modified form of apparatus shown in Figure 6, taken on a line corresponding to line 4—4 of Figure 3;

Figure 8 is a diagrammatic view in side elevation illustrating the basic relationship of the inclined end wall to the length of the court of the form of apparatus shown in Figures 1 to 5, and also of the form of apparatus shown in Figure 6;

Figure 9 is a diagrammatic view similar to Figure 8, showing a modified form of apparatus;

Figure 10 is a diagrammatic view similar to Figure 8, showing still another modified form of apparatus.

Referring now to details of the embodiment of my invention as shown in the form of apparatus disclosed in detail in Figures 1 to 5, both inclusive, the apparatus consists essentially of a playing table court indicated generally at 10, an abutment or end wall 11 rising from one end of the court area. Side walls 12, 12 preferably extend forwardly from the side edges of the abutment wall and terminate adjacent the front end

of the court, which for convenience may be referred to as the player end of the court. The side edges of the court 10 and the side walls 12, 12 preferably diverge forwardly toward the player end of the court.

The playing court 10 shown in the drawings is disposed at approximately the same height as a conventional table tennis court, in the form shown the apparatus being supported on four legs 13, 13 connected to suitable frame members 14, 14 extending horizontally beneath the front and rear ends of the playing court, and cross-connected side frame members 15, 15 connecting the front and rear pairs of legs, as shown in Figures 3 and 4.

In the form of apparatus shown in Figures 1 to 5, the playing court 10 consists of two plane areas or panels 17 and 18 disposed in a generally horizontal plane but with the rear court panel 17 inclined downwardly at a slight angle from the horizontal toward the player end of the court for approximately two-thirds of the full length of the floor court area, and the second court panel 18 being inclined upwardly at a slight angle from the horizontal for the remaining one-third of the full length of the court area. The terminal edge 20 of the panel 18 at the player end of the court may be termed the base line of the court, and as shown herein may be substantially straight except where it is slightly curved or rounded at opposite ends of said base line. The two court panels 17 and 18 are disposed at a relatively wide angle of approximately 164 degrees to each other and at substantially equal angles of 8 degrees to the horizontal.

The function and advantages of this angular relationship of the court panels 17 and 18 will hereafter more fully appear.

The abutment or end wall 11 of the form of apparatus shown in Figures 1 to 5 consists of two similar upright panels 21 and 22 arranged at a wide dihedral angle to each other, diverging horizontally toward the player end of the court. The vertex or line of intersection between the panels 21 and 22 is disposed in a vertical plane including a longitudinal axis of the court which for convenience in Figure 1 is indicated by a line 23, which may be actually marked on the upper surfaces of the floor panel sections 17 and 18 if desired. The horizontal angle between the two panels 21 and 22 as shown is approximately 175 degrees, with each panel section diverging at an angle of approximately 7½ degrees to a line drawn perpendicularly to the longitudinal axis 23 of the court. This inclined angular relationship of the abutment wall toward the playing court constitutes a characteristic and important feature of my improved game apparatus, as will presently more fully be described.

Figure 6 shows a modified form of apparatus which is similar in all respects to the form shown in Figures 1 to 5, excepting that the end or abutment wall 11*a* comprises a single panel extending the full width between the side walls 12, 12 instead of having two end panels 21, 22 arranged at a wide dihedral angle to each other, as previously described. The end panels 21 and 22 of the form shown in Figures 1 to 5 are disposed at such a wide dihedral angle to each other that they may be considered as disposed in substantially the same plane for the purposes of explaining the characteristic angular relationship of the abutment wall to the length of the playing court.

A continuous line 28 is marked horizontally along both of the end panels 21 and 22 of the form of apparatus shown in Figures 1 to 5 intermediate the base and top edges of said panels, and a corresponding line 28 is marked along the single end panel 11*a* of the form of apparatus shown in Figure 6. These horizontal lines constitute the upper boundary of a predetermined horizontal playing area on both said end abutment panels, so disposed that a ball fairly struck from any position at the player end of the court and rebounding from the horizontal playing area below its horizontal boundary line will normally be deflected downwardly to rebound upon the court area 10 before the ball passes beyond the base line 20 at the player end of the court.

The characteristic relationship between the height and inclination of the playing area and the length of the court essential for insuring a rebound of the ball on the court area, regardless of how hard the ball may be struck, may now be explained more fully by reference to Figure 8 of the drawings, wherein this relationship is illustrated diagrammatically. In this figure, B represents the horizontal boundary line 28 denoting the upper limit of the playing area BC of the abutment wall. CD represents the length of the upwardly inclined table court section 17 of the apparatus.

The several rebounding areas thus designated are arranged so that, regardless of minor permissible variations in the lengths of the areas BC, CD or DG which may be selected for the apparatus, the angle CBG will be approximately 90 degrees in each instance. For instance, assuming that the trajectory of the ball continues in a straight path after each rebound and the angle of rebound is equal to the angle of incidence with each rebounding surface, it will be understood that, with the relationship of the rebounding surfaces shown diagrammatically in Figure 8, a ball propelled from just above the base line G and striking the abutment wall BC at its extreme upper end B will be returned for a rebound on the court area substantially at the base line G. If the ball is propelled from any point above the base line G, the ball will be deflected downwardly at a greater angle, depending upon the height from which it is propelled.

Although the angle CBG should theoretically be no greater than 90 degrees, in practice this angle may be a few degrees more than 90 degrees without substantial danger that a ball struck against the end wall from any position at the player end of the court will pass over the base line G before rebounding on the playing court. This is due to the fact that in practice it is impossible for most skillful players to impart sufficient velocity to a ball to maintain its trajectory in a straight path for approximately twice the length of the court, since the trajectory will normally be sufficiently affected by gravity and by loss in velocity upon rebound from the end wall that it will tend to curve downwardly to some degree before it rebounds on the court area. Even though skilled players may stroke the ball with sufficient overspin to produce a rebound from the end wall BC at an angle somewhat higher than the normal angle of incidence, it is seldom, if ever, possible to produce a sufficient upward deviation of the ball in this manner to return the ball in flight beyond the base line G.

Accordingly, for the purposes of the present invention, it will be understood that the angle CBG should be substantially a right angle in all cases, although it might exceed this value by a few degrees without materially affecting play.

On the other hand, this angle CBG should not be substantially less than a right angle, if a reasonably fast game is desired.

The relative length of the playing area CG and the height of the end wall CB may be varied within reasonable limits, provided the angle CBG is maintained substantially at a right angle, as just described. For best results however, the playing court should be considerably longer than the height of the end wall, with the latter in a fairly upright position. For example, an arrangement wherein the horizontal length of the playing court CG is approximately six feet, the end wall BC may be approximately two feet; that is to say, from the base of said end wall to its upper horizontal boundary line B.

Since the angle CBG is substantially a right angle, the triangle CBG is therefore a right triangle. If the height CB is two feet and the length and the court CG is six feet, then in the right triangle CBG the cosine of angle theta is equal to

$$\frac{CB}{CG}=\frac{1}{3}$$

From the table of natural functions, angle theta would, therefore, be equal to 70° 44'. From this formula, it is seen that the height CB of the abutment wall from its base to the upper boundary line will vary as the cosine of the angle theta and the length of the table will vary inversely as the cosine of the angle theta.

It will be observed that the above formula for determining the angle of inclination of the end wall to the court will not be affected by the presence of the inclined court areas CD or DG or by permissible variations in the relative lengths or inclinations of said court areas to each other. In fact, another modified form of apparatus shown diagrammatically in Figure 9 may be employed in which the entire court consists of a single plane area coincident with the plane CG of Figure 8. Obviously, the characteristic relationship between the height and inclination of the end wall to the length of the court will be the same as in the forms of apparatus shown in Figures 1 to 5 and Figure 6, respectively.

A still further modification of the apparatus is shown diagrammatically in Figure 10 wherein the major portion of the court area corresponding to the court panel 17 of the forms shown in Figure 1 is disposed in a substantially horizontal plane, while a minor portion of the court area corresponding generally to the court panel 18 at the player end of the court is inclined upwardly at a wide angle to the horizontal. The angular relation of the court areas and the end wall remain the same as in the form shown in Figure 9, excepting that they are all tilted bodily to dispose the major portion of the court area in a horizontal plane.

Referring again to the apparatus as used in play, it will be observed that the end panels 21, 22 of the form shown in Figures 1 to 5 and the corresponding single end panel 11*a* of the form of apparatus shown in Figure 6 are extended upwardly a substantial distance above the horizontal boundary lines 28 in each instance. The side walls 12, 12 are also extended upwardly. This arrangement is particularly desirable to insure the return of balls which may be unintentionally propelled by the player so as to strike the end wall above the horizontal boundary line, thus saving loss in time and effort by the players in retrieving the ball even though it may be declared

out of play by reason of striking the end wall above the playing area demarked thereon.

While the main characteristics above mentioned with respect to the various forms of apparatus hereinabove described are practically identical, the form of apparatus shown in Figures 1 to 5 with divergent end panels 21, 22 has one practical advantage whereby a ball which is hit straight up one side of the court toward the panel on that side will tend to rebound obliquely toward the other side of the court. Also, when any ball is hit diagonally toward a panel on the other side, it will tend to rebound straight down the other side of the table. This tends to prevent interference between the two players as the game proceeds, since each of the two players can stand toward his own side of the end of the table and the ball will tend to rebound toward the other player regardless of what part of the abutment wall it strikes.

The basic relationship between the height and inclination of the end wall and the length of the court which characterizes the various forms of apparatus previously described may be defined as consisting in the arrangement wherein the playing area on the end wall is inclined upwardly at such an acute angle to the general plane of the court that a plane intersecting the upper horizontal boundary of said playing area substantially at right angles to the latter will intersect the court substantially along the base line of the latter.

This basic relationship is maintained in the preferred form of apparatus shown in Figures 1 to 5, even though the end panels 21 and 22 are in diverging planes, by inclining the horizontal boundary line 28 marked on these panels downwardly at a slight angle toward the outer edges of said panels to coincide with the right angle plane indicated by the dotted line 29 in Figure 3.

The several forms of apparatus shown and described herein are also adapted for play under a different set of rules in which the ball is permitted to rebound either on the table court surface 10 or upon a floor court area within the prescribed limits; as for instance, within the boundary line 45 marked on the floor at the player end of the court, as shown in Figure 1. When the apparatus is employed for this type of game, it is usually desirable to provide an upright panel 46 immediately adjacent and below the base line 20 of the table court, so as to close the space between the table court and the floor and prevent unintended escape of balls beneath the table when the latter may be accidentally struck in that direction. It will be understood, however, that the panel 46 is not essential to the play of a game of this character since it is only provided to minimize the necessity of retrieving balls improperly struck beneath the table court 10.

The use of my novel game apparatus will already be apparent from the preceding description but the following general observations may be added:

Although the novel apparatus is adapted for playing a game including a paddle or bat and a table tennis ball or the like, the provision of the forwardly inclined abutment wall having the characteristic inclined relationship to the length of the court introduces certain novel elements of skill in playing technique unknown to squash, tennis and similar games.

For instance, any initial rebound from the in-

clined abutment wall is caused to strike the court and then to rebound therefrom at a considerably greater angle than in games where the abutment wall is in the usual vertical position relative to the playing court. Hence with the present apparatus, the sharpest and most direct returns from the abutment wall toward the base line of the court are produced by striking a ball toward the wall from as low a level as practicable, and directing it upwardly toward the upper portion of the playing area on the end wall, demarked by the boundary line **28**. This is contrary to the method of play in table tennis, wherein the swiftest return shots must be made by striking the ball from a relatively high point above the court so as to clear the net and still stay within the base line of the opposite court. Accordingly, with my novel apparatus, the player has exceptional opportunities to increase or decrease the speed and angle of rebound from the court, depending upon the height from which he chooses to strike the ball. Nevertheless, the players are always assured that the ball, initially propelled against the end abutment wall at any point below the horizontal boundary line **28**, will rebound on the court so as to keep it in play, regardless of the height or speed at which the ball may be struck from the player end of the court. This ability to keep the ball in play is, of course, enhanced by the provision of diverging side walls **12, 12**, which also add to the diversity of play. Accordingly, the apparatus of the present invention affords the unique effect wherein the ball is repeatedly "funneled" back to the players, regardless of the point from which the ball may be struck toward the end wall, or the point from which the ball rebounds from the playing area on said end wall.

In further comparison with the game of table tennis, my novel apparatus makes it possible to play the game with far less floor space than is required for table tennis. The table court itself is only about one-half the length of a standard table tennis court and, in addition, the "funneling" effect previously mentioned insures that the ball will be returned to the player end of the court within easy reach of both players so as to require much less lateral foot room or floor space for the playere. This feature is especially enhanced by the upwardly inclined table court panel **18** at the player end of the court. This upwardly inclined area produces a higher rebound of any ball striking said area than the normal rebound when the entire table court is in one plane.

As a result, those balls which rebound on the upwardly inclined court area **18** near the player end of the court, which otherwise would tend to rebound from the court at a relatively low angle and at a relatively high speed, are caused to rebound at a higher angle and at a reduced speed, thus making it easier for a player to return the balls with less bodily movement toward or away from the table. On the other hand, balls which rebound on the downwardly inclined court area **17** nearer the end wall are returned to the player end of the court at a lower angle and therefore at somewhat greater speed than on a level court.

The difference in angle of rebound from court areas **17** and **18**, as just described above, is illustrated graphically in Figures 1 and 3, wherein a ball J is struck from a point beyond the player end of the court adjacent the base line or edge G, so as to strike the end panel **22** at point K substantially below the horizontal boundary line **28**. For convenience in illustration, the trajectory of the ball is indicated in a substantially straight line, although in practice the trajectory will be affected by gravity depending upon its speed. The ball will rebound from the end panel at an angle substantially equal to its angle of incidence, in accordance with the well-known law. Disregarding any effect of initial spin which may be imparted to the ball, as well as the effect of gravity, the ball will travel from point K so as to strike point L on the downwardly inclined court panel **17** at a relatively small angle thereto, as seen in Figure 3. Again rebounding from point L, the ball will travel along a relatively low trajectory indicated by the line LM.

When the ball J is struck at a substantially higher angle so as to strike the abutment panel **22** at point N immediately below line **28**, its initial rebound will be directed at a downward angle so as to strike the upwardly inclined court section **18** at point P. The angle of incidence of the ball to the court at point P will manifestly be considerably greater than the angle of incidence of the ball when rebounding from point L on the downwardly inclined court section **17**, as previously described. As a result, the final trajectory of the ball as it passes from point P substantially along line PQ will be much higher than the trajectory LM, and consequently at a lower horizontal speed, making it easier for the player to return it.

Figure 1 also shows the trajectory of the ball indicated at JRST, which is substantially at the same level as the trajectory JKLM but including an additional rebound S on one of the side walls **12**. This illustrates the wide diversity of play which may include rebounds on the side walls as well as the end abutment wall, but in all cases the ball will be "funneled" back to the players at the open end of the court with at least one rebound of the ball on the court area whenever the ball is fairly struck against the abutment wall below the horizontal boundary line **28**.

Consequently, the game requires great alertness and skill to keep the ball in play but, at the same time, the players are enabled to stand considerably closer to the base line than in table tennis or similar games. Since most returns are "funneled" back so as to be practically within arm's reach of the players, much less foot work is required than in other similar games. In fact, when the game is restricted to rebounds upon the table court only, the apparatus readily lends itself to use by players who are partially, or even wholly, incapacitated as to foot work.

When the game is played under rules permitting a rebound within the floor court area **45**, as well as on the table court panel areas **17** and **18**, the ball may be played by bouncing it against the end abutment wall above the horizontal boundary line **28**, and permitting a single rebound upon the floor court after the ball has been returned beyond the base line G of the table court area.

The added diversity of play inherent in this type of game is illustrated graphically in Figure 2, wherein the ball is struck from point J beyond the base line or court edge G so as to strike the end panel **22** at a point V substantially above the horizontal boundary line **28**, and with sufficient velocity that it does not strike the table court area, but will be carried in flight over the base line or edge G for its first rebound at point W within the floor court area **45**. When playing this type of game, it may also be op-

tional for the player to strike the abutment wall at any point below the horizontal boundary line 23 for a first rebound on the table court, with the same variety of shots previously described in connection with Figure 1, so that the ball will be rebounded from either panel 17 or 18 of the table court area before it passes beyond the base line G for a second rebound on the floor court. It will be understood of course that, in playing the second type of game just described in connection with Figure 2, the players would normally stand farther back from the base line G, and that considerably more foot work would ordinarily be required because of the greater diversity and range of play involved.

Although I have shown and described certain embodiments of my invention, it will be understood that I do not wish to be limited to the exact construction shown and described, but that various changes and modifications may be made without departing from the spirit and scope of the invention as defined in the appended claims.

I claim:

1. In a bouncing ball game apparatus, an elongated table provided throughout its length and width with an unobstructed playing surface and having the forward end thereof as a player position end, an abutment wall fixed to and projecting upwardly from the opposite end of said table and having a plane unobstructed ball rebounding surface inclined at an acute angle to the plane of an adjacent portion of said table playing surface, said abutment wall having a playing area with its upper limit defined by a linear marker extending transversely of the abutment wall, the relative length of said table and height of said playing area being such that a line extending from the player position end of the table to said marker is normal to said playing area, whereby a ball impinging the rebounding surface of said area will always rebound initially toward the table short of the player position end thereof, and said table playing surface comprising a main playing surface of major area inclined downwardly from said abutment wall toward said player position, and an auxiliary playing surface of minor area inclined downwardly from said player position end into juncture with said main playing surface intermediate said abutment wall and said player position end.

2. The structure according to claim 1, wherein said surface of major area is substantially twice the length of said surface of minor area longitudinally of the table.

3. The structure according to claim 2, together with ball confining walls extending upwardly from said table and diverging from the lateral edges of said abutment wall to points adjacent said player position end of the table.

4. In a bouncing ball game apparatus, an elongated table provided throughout its length and width with an unobstructed playing surface and having a forward end thereof as a player position end, an abutment wall fixed to and projecting upwardly from the opposite end of said table and having a plane unobstructed ball rebounding surface inclined at an acute angle to said playing surface, said ball rebounding surface having a generally horizontal boundary line thereacross defining upper and lower rebounding surface areas, the relative length of said table and height of said boundary line being such that a line extending from the player position end of the table to said boundary line is normal to the plane rebounding surface thereof, whereby a ball impinging said lower rebounding surface area will rebound initially toward the table short of the player position end of the latter, and a second playing surface beyond and below the level of said first playing surface and extending forwardly of said player position end and onto which a ball impinging said upper rebounding surface area with sufficient force will be rebounded when it passes over and beyond the player position end of the table.

5. The structure according to claim 4, wherein an upright backstop wall closes the space between the first and second playing surfaces.

6. The structure according to claim 4, together with ball confining walls extending upwardly from said table and diverging from the lateral edges of said abutment wall to points adjacent said player position end of the table.

GEORGE H. FORSYTH.

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